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The future of airports post COVID-19

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ABSTRACT

COVID-19 pandemic has hit most sectors of the world and has led to many industries coming to a standstill. It has led to restrictions of movement and travel ban. As a result of these restrictions, transport sector especially in aviation has impacted badly.

With the uncertainty of further impact of the current situation, there is a likelihood of the aviation business rebounding at a slower pace bringing V-shape and U-shape recovery as per analysis of economic impacts on civil aviation by International Civil Aviation Organization (ICAO (2020). Currently, airline capacity is down 70 to 80 percent in April 2020 compared to April 2019, and multiple large airlines have temporarily ceased operations. Largely, almost 60 percent of the global fleet was grounded in early April 2020 as per McKinsey report (Curley et al., 2020).

In order to support the sinking capacities and revenues, the International Air Transport Association (IATA) calls on the European governments to provide relief to their airlines to sustain their operations. Furthermore, this document highlights the future of airport and air transport industry based on revenue generation sources, cost control strategies and integration of innovations with respect to variable demand and capacity during and post COVID-19.

1. Introduction

1.1. Current situation description - research rationale

Aviation industries become one of the important sectors among the other industries that contribute to the global economic growth. As seen in Fig. 1 which publish by ALG newsletter (ALG-Global, 2020), the ongoing COVID-19 outbreak has become one of the hardest global health event that affect global GDP growth which expected to be negative in 2020.

As published by Air Transport Action Group (ATAG) in their article (ATAG, 2020), 65.5 million jobs around the world are supported by aviation industries from a different type of jobs such as direct employment of aircrew, airport operators, airlines, air navigation service providers and also indirect employment which include fuel suppliers, construction companies, suppliers of aircraft companies and many others. In addition to that, from 65.5 million jobs it discovered that around 36.7 million is coming from the tourism sector where air transportation plays a vital role to carry passengers and essential goods across the country. That number proved that aviation is central to international trade and economic development for every country.

The current COVID-19 crisis has forced aviation industry to adjust quickly to adapt to the situation. With many aircraft grounded due to significant decrease of passenger demand, the airlines try to find alternate, quick and effective measures to be able to survive as the crisis continue worldwide. In reaction to the current situation, the International Air Transport Association (IATA) has published its press release (IATA, 2020), which states that every government have important role to support the aviation industry especially in the financial sector such as direct financial support, loans and tax relief. IATA also mentions that currently, over 2.7 million-airline job is at risk.

While the airlines have to stop flying due to significant decrease of passenger demand, the airport operator does not have many choices rather than to maintain their operations to facilitate important movement such as repatriation and cargo flights. Moreover, at the same time the airport need to support airlines by providing certain area to use as new aircraft parking positions. As stated by Airport Council International (ACI) World Director General, Angela Gittens from ACI media release article (ACI, 2020), the recovery of overall aviation industries could take up to 18 month to reach pre-crisis traffic levels. The same concern also highlight by ACI that a quick and accurate response related to global economic policy is needed to protect the critical airport

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operations which mean at the same time it will protect millions of jobs around the world.

With the current situation, the airport operator had more concerns about financial strategy as for the airport they have high fixed and unavoidable costs. In response to the crisis, many of the airports taking difficult decisions by closing portions of infrastructure and reevaluating the airport capital expenditure to reduce the cost to a minimum. Philip Villard on his ACI blog (Villard, 2020) stated that a strong policy response is required by the airport to handle the financial challenge during COVID-19 crisis, one of the action that government or local authority could take is to wave or postpone airport rents and concession fee applicable to airports. Waiving such kind of cost would help airport operators to relieve financial stress so that they can focus and continue operate as well as focus on the airport recovery strategies.

1.2. Research questions and goals

Sudden and violent COVID19 outbreak created an emergency and urgent situation not only for airports to ensure safe airport operations but it is also a challenge for all stakeholders in the air transport industry. Airports have never encountered anything like this and must solve problems on the fly. The difficulty is that this crisis has affected not only large airports, but all, including regional ones, which often do not have the resources to be able to identify all the problems and find ways to solve them. The aim of our research is to analyze the current situation and find answers to these questions in particular:

- What measures can airports take immediately to respond to the situation?
- What are the possible next scenarios?
- What new aspects will affect changes in the airport design and operations?

2. Research methods

Our research is a type of an explanatory research. According to (Brixi et al., 2012) 'it explains and confirms the behavior or dependencies in the system and tries to explain the patterns in the behavior of the system, its processes and structure; explanation is an attempt to understand the causes of the phenomena, factors and mechanisms that cause them'. Our explanation strategy is inductive, where we try to explain the behavior of the system using some of the 'known' principles, setting general rules and recommendations based on specific cases. The problem of induction could be that ' … mind often draws conclusions from relatively limited experiences that appear correct but which are actually far from certain' (Stanford Encyclopedia of Philosophy, 2018). When using induction, there is often a problem with the results verification. In our case, we verify and confirm the results by comparing solutions and findings from different cases.

It is also an 'action research'. As the name suggests, it is research focused on action aimed at solving various organizational problems, which is carried out by a number of events and activities. It is a process of data collection on the functioning of the examined system in relation to the set intentions and goals (Shepard, 1960).

In our research we used the historical method. Historical method comprises the techniques and guidelines by which we use primary sources and other evidence to research. Historical method allows to examine particular events or processes that occurred over short spans of time (Anilkumar, 2014). Historical research can also mean gathering data from situations that have already occurred and performing statistical analysis on this data just as we would in a traditional experiment. (Kazda, 1985).

For our research we collected data – wide range of guidelines, standards and recommended practices, findings, reports, airport manuals and documents published by international organizations, state authorities, airlines and airports.

3. Possible scenarios

The ongoing COVID-19 global health crisis has affected economic sector hardly, which is giving direct impact to a various business company. In this uncertain situation, it is important for each of business leader to implement their strategic approach to the crisis that will later decide the future of their business in upcoming new economic situation.

Rohit Talwar, CEO of Fast and Future Research stated on his article (Talwar, 2020), that in the response to the COVID-19 crisis, it is important to take into consideration by separating actions in three different time frames:

- **The next three to six months** - how the company/business deal with the immediate impacts on and protection of the staff, travel and events, the company/business supply chains, operating locations, demand for the company/business products and services, cash flow, pricing, marketing, and brand reputation.
- **The next twelve months** - How the company revisit every aspect of the business and operating model - encompassing all of the above - if the virus and resulting economic impacts might continue to effect the company over the coming year.
- **The next one to three years** - How might the company change the shape of the business, location footprint, sourcing, and routes to market, product and service offerings, staffing models, and use of technology if the knock on effects have a more dramatic impact on the company/business markets and the economy more widely.

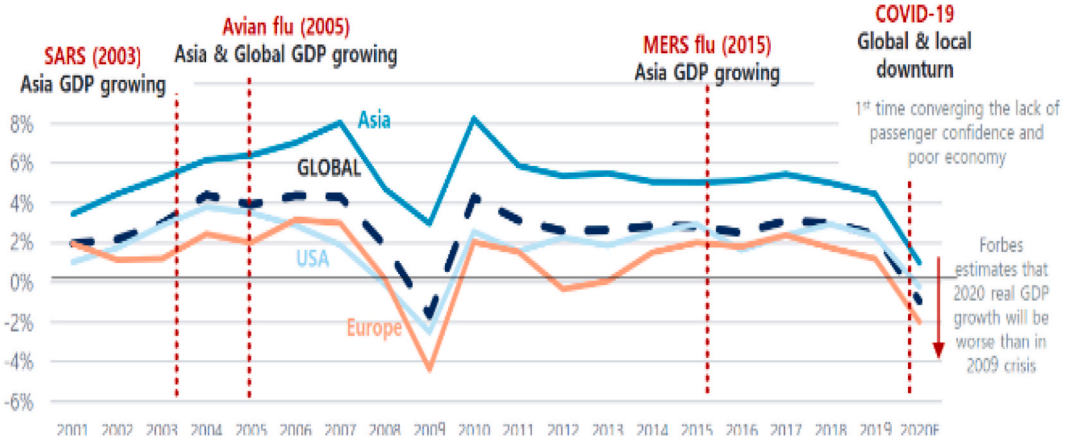

Fig. 1. Global health event and impact to GDP growthSource: ALG newsletter (ALG-Global, 2020).

The COVID-19 crisis becomes a serious wake-up call for all business sectors especially the one with global operations scope. Therefore exploring multiple approaches and scenarios is important for each company to ensure the correct decision taken in place according to the company/business strategies.

4. Passenger traffic forecast per scenario

Financial crisis of 2008–2009 known as 'the great recession' was one of the worst situations for airlines in terms of passenger traffic figures with the annual traffic number dropped significantly between 10% and 15%. However, according to the document published by the consultancy company named Copenhagen Optimization (Copenhagen Optimization, 2020), a unique observation from 2009 found that the peak traffic level at airports remained largely unchanged, this was mainly because of the airlines' capability to fly during the peak time. The consultancy company also said that similar scenario is expected during the rebound of the traffic after COVID-19 crisis.

In addition, the company has created a scenario guideline based on the peak and annual passenger numbers according to their pre-COVID-19 level from a lower to a higher number (see Fig. 2).

From Fig. 2, it is apparent that the worst-case scenario is when the annual passenger numbers are lower and the peak volume is higher which results in a challenging situation for the airports, where the focus must be on optimization of processes to avoid building more infrastructure. Meanwhile for the best scenario that can happen is when the annual passenger numbers are higher and the peak volume is lower.

5. Steps for the future

Currently, most of the airports are implementing their business continuity plans that outline how service and essential operations are maintained during this COVID-19 crisis. At the same time, the airport operators have been forced to re-evaluate their normal business and operational processes.

With the current situation, it is hard for the airport to continue their investment because it is predicted that the recovery phase will take a lot of time. However, there are a technologies that will help the airports to bounce back, such as self-service and contactless technologies for every process at the airport. This kind of technology will be able to reduce operational cost, improve passenger experience and at the same time minimize the spread of the virus.

One of the common technology/IT solutions that the airport can implement and conduct during this crisis is the use of biometric solutions (facial/fingerprints/iris recognition) which also include the paperless process. By using biometric solutions, it will largely reduce contact at all passenger touchpoints such as check-in counter (including baggage drop), border clearance, and even boarding process that will support the health measure at airports during this crisis. Below Fig. 3 shows how to provide the end-to-end process of biometric implementation at the airport.

Additionally, at the same time the airport operator will require refinancing packages and loan modification programs to manage the outbreak by cutting the financing costs.

5.1. Resize the available infrastructure to the new demand

The new levels of demand will require, lower capacity of airport infrastructure, both on the airside (except the overflow aircraft parking) and on landside, which is demonstrated by most of the airports worldwide, by massive closings of terminal buildings, concentrating single-roof operations.

According to an article by International Airport Review (International Airport Review, 2020), the operation at Madrid-Barajas Adolfo Suarez Airport (MAD) significantly have changed which concentrated all its flights on Terminal 4. The other Spanish airport Josep Tarradellas Barcelona-El Prat Airport (BCN) also closed the Terminal 2 to focus on Terminal 1, also the same measure were implemented on smaller airports, such as Los Cabos, which relocated all airlines to a single terminal.

Despite the reality of this scenario, there is a new variable that will come into play and that can have a significant impact on the operation of airports. The social distancing will be present in our lives for a few months and therefore airports must establish all the necessary measures in queues and gathering zones to comply with new rules. This extra distance, which must be offered, will reduce the peak hour processing capacity of each of the subsystems of a terminal building, similar to increase the service level according to the Airport Development Reference Manual (ADRM) of the IATA (IATA, 2019).

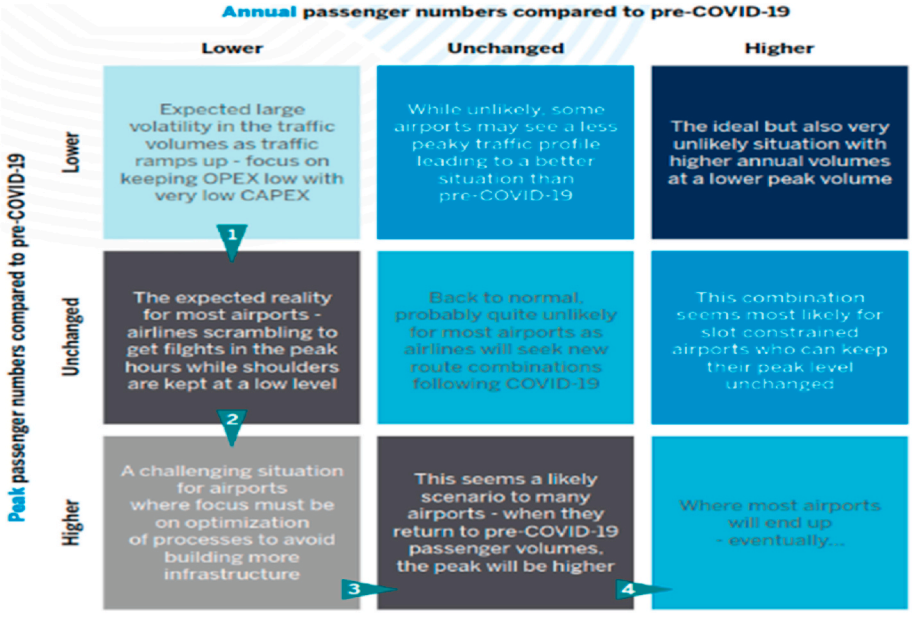

Fig. 2. Scenario Guideline based on peak and annual passenger number pre-COVID-19
Reference: Copenhagen Optimization (Copenhagen Optimization, 2020).

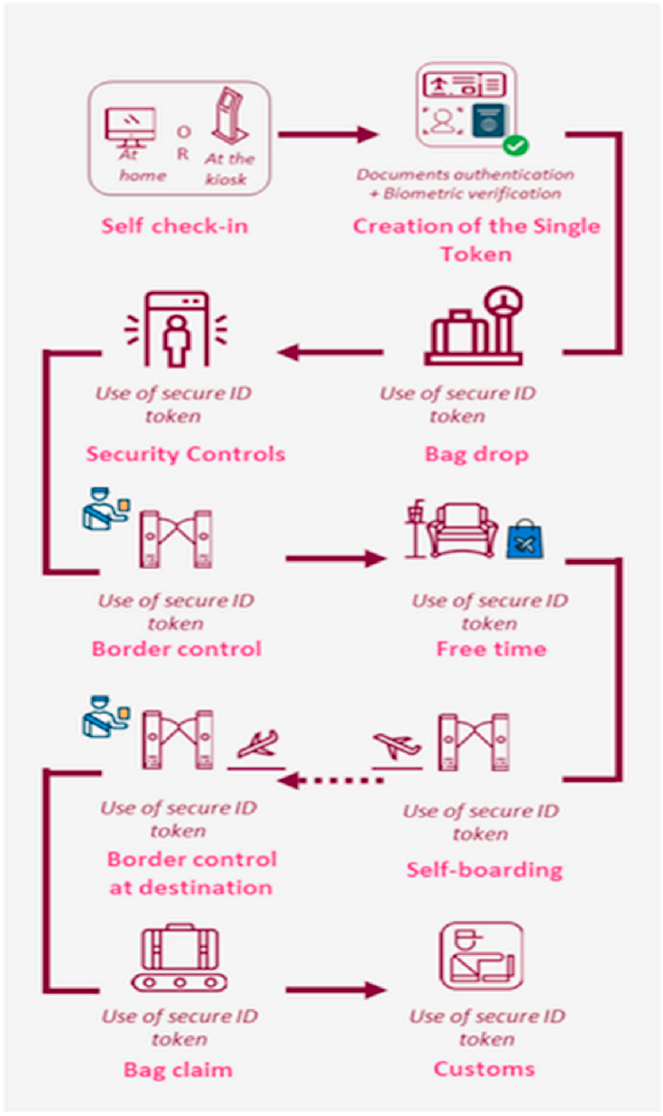

Fig. 3. End to end biometric process at the airportReference (Sia Partners, 2018):.

6. Financial decisions

The financial impact on airports is massive and it will take several years to regain what was lost during the COVID-19 standstill period. With the current situation, the focus is on what this means for the airport operational planner, both short-term and long-term.

For Capital expenditure (CAPEX), it is assumed that multiple infrastructural investments will be postponed or even eliminated. In the short term, the need for investments will most likely be limited as traffic is lower than pre-COVID-19. As traffic levels return to their pre-COVID-19 levels, it is expected that CAPEX budgets to continue being impacted by COVID-19. Longer-term, this means that the current available infrastructure needs to last for longer, thereby driving the need for optimization. For Operational expenditure (OPEX), the main short-term challenge will be to balance costs to an unstable developing demand. The increase in cleaning costs are expected to continue well into the future and may find a structurally higher level compared to pre COVID-19.

In addition, it is expected for airports to have an increased focus on reducing OPEX costs. As currently, airports are thoroughly reviewing their current OPEX budget with a focus on the reduction of staffing costs (both internal and external staff costs).

A short-term element for airports to consider is when to reopen the parts of the airport that were shut down in a reaction to the massive drop in traffic. The trade-off is between increased OPEX when opening more infrastructure against keeping social distancing and satisfactory performance in the open parts of the airport.

The optimization effort should start even before traffic ramps up, as the COVID-19 standstill has provided an option to start from the scratch. COVID-19 is a unique opportunity for airports to adapt their current operation with a focus on improved processes and planning and could ease the change of management effort.

7. Increase revenues

7.1. Aeronautical and non-aeronautical revenue in post-COVID19 world

When this unprecedented crisis comes to end, the biggest major mistake airports could make is by handling the cash liquidation crisis instead of planning and turning the business into new normal. It will be the utmost importance for airports to be more proactive, capable of enhancing digital transformation in the organizational and commercial sense as well as of repositioning themselves in the global aviation industries. Route growth, attracting new airline customers, maintaining and increasing with current customer, as well as updating and executing the route expansion strategy, will play an essential role in the post-crisis environment.

Commercial policies for airlines need to be attractive in order to safeguard existing businesses and capture market share from competition in order to ensure higher aeronautical revenues, typically through passenger and landing charges. As stated by Kimmo Ruotsalainen in Airport Investor Resource article (Ruotsalainen, 2020), the non-aeronautical component may play a more critical role in the generation of incremental revenue (see Fig. 4). Airport non-aero revenues can usually contribute 40–60 per cent of overall revenues, but the margins of these sales can be very high and can contribute almost 70–80 per cent (see Fig. 4) of the earnings before Interest, Taxes, Depreciation, and Amortization (EBITDA).

In addition, airports can directly increase the non-aeronautical revenues by enhancing the services, sanitized environment and the human element in order to improve customer loyalty and increasing the overall satisfaction of the customer's journey. In fact, the execution of customer service is critical, because the best way to increase non-aeronautical revenues is to increase customer satisfaction. This includes the ability of the airport to recognize potential new customer profile. To boost the overall process, airport operator may need to spend more on customer

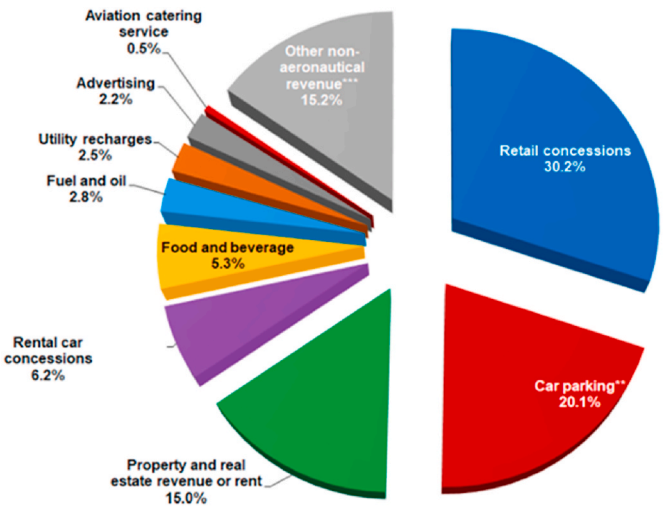

Fig. 4. Non-aeronautical revenue contributionReference (Ruotsalainen, 2020):.

analytic tools to identify and understand their passenger profile in order to customize individual customer experience.

More importantly, in the sense of airport cash flow and sales it is vital that the airport operators attracts the right combination of retailers as well as other concessions on non-aeronautical market. This involves not only formulating a concession agreement to increase net income from commercial operations, but also working closely with these concessions to mutually achieve the ultimate goal of optimizing overall customer experience.

7.2. Financial support

COVID-19 has extremely affected airlines and airports to a standstill situation. Most airlines have grounded their aircraft while they cannot stop the other operating and maintenance cost. Similar situation can be seen with airports operations as air traffic has reduced a lot due to the low demand for passenger booking and travel restrictions imposed by the countries. In this situation, airports are losing takeoff and landing fees that are coming from airlines to maintain airport operating cost. It is not just that, without having passengers at the airport means there is no revenue for airport retailers and concessions and at the end, they may stop paying rent to the airport operator. In this scenario, airports have more operational costs without any revenues. Therefore, airports need financial support from their governments. According to ALG Transport & Infrastructure published document (ALG Transport and Infrastructure, 2020), the governments should start as soon as possible a range of measures that will be required to ensure the sustainability of airport operations (see Fig. 5). The measures are as follows:

- Provide economic, financial and fiscal relief measures.
- Waive concession airport fees (where applicable), fees and taxes.
- Delay infrastructure investment requirements.
- Temporary relief from compliance with quality of service.
- Suspension of the 80/20 slot rule for a limited period.

7.3. Diversify

Airport revenue comes from various streams and depends on many factors such as size, passenger flow, airline routes, and on the local and regional regulations. The biggest revenue for airports comes from passengers on commercial flights aside from they have multiple cargo flights together with nonscheduled movements. For instance, the busiest airport in Europe London Heathrow Airport welcomed 80.8 million passengers in 2019 (ACI, 2019). Heathrow Airport generates two primary types of income: aeronautical income, which is generated from fees charged to airlines for use of the airport's facilities, and retail and other income from a variety of other sources. Passenger charges are based on the number of passengers per aircraft. Below Fig. 6 reflects total revenue of Heathrow Airport for 2019 as per their annual report (HEATHROW, 2019) where aeronautical revenue that comes from passenger movements and fees charged from airlines.

7.4. Create common funds for government incentives and public agencies

It is a common understanding that successful and rapid recovery of the aviation industry will require full coordination with all stakeholders involved in the air transport industry and it is suggested that the airport shall lead such cooperation. The primary coordination of the airport operator will be with the airlines, in particular with a view to sharing the information and vision of the industry, with the aim of participating, in the most adequate manner, in the development of continuous demand. In order to encourage this development, airports will need to discuss with other agencies benefiting from air transport, such as consult chambers of commerce, hotel groups, tourism agencies, foreign investment offices, regional governments, etc. in order to provide airlines with all the necessary support to return to a more normal scenario.

Although this type of coordination already exists in different regions between some or all of these entities and the airports, it is understood that the exceptional situation currently experienced by air travel industries requires a step further and a greater degree of involvement of each of the parties will be required.

As an example from the case of the Committee for the Development

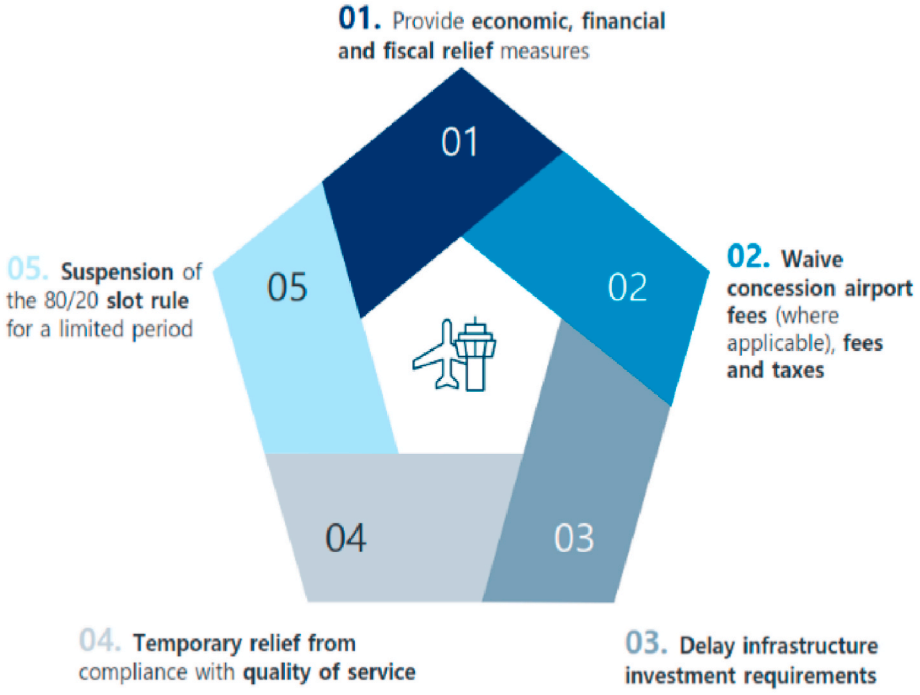

Fig. 5. Five measures/initiative from government for airport operatorReference (ALG Transport and Infrastructure, 2020):.

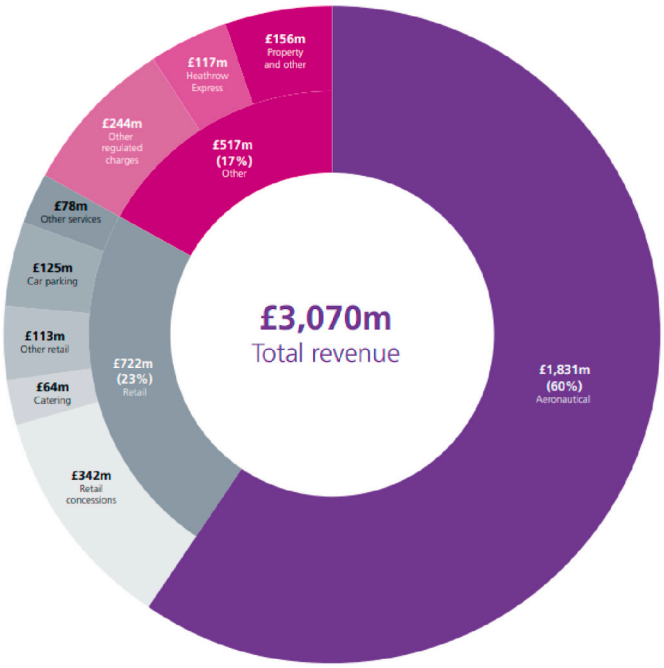

Fig. 6. Heathrow airport revenue-2019
Reference
(HEATHROW, 2019):.

of Air Routes (CDRA) of Barcelona they have a successful tool for promotion of Barcelona Airport traffic that, with technical and financial support from each of the participants, they could managed to develop in an extraordinary way the long-haul markets which, in that case, was the target with more potential from the airport.

The committee has an own management body with dedicated teams on time complete to meet the constant needs requires an airport of these magnitudes. However, this scheme does not require large airports or budgets to justify their existence or to validate their ability to generate value to the region. Airports of smaller size can develop similar schemes, with simpler corporate governments, where all parties agree to cooperate and participate in jointly in this industry.

Furthermore, according to U.S. department of transport (U.S. Department of Transport, 2020), in the wake of COVID-19, the U.S. transportation secretary Elaine L. Chao announces $10 billion in relief for America's airports from the Trump Administration's the Coronavirus Aid, Relief, and Economic Security (CARES) Act Airport Grant Program. This will help fund the continued operations of America's airports during this crisis and protect airport community from the potential impact of COVIID-19.

8. Cost optimization and cost reduction

8.1. Review the debt profile to ensure the business continuity

With the ongoing COVID 19 issue, airport operators need to understand their debt profile and how willing they are to endure them. This will help them to easily review the profile with the lender to ensure continuity. Another alternative for some airports will be refinance, readjusting the original terms of the debt to facilitate repayment. For those airports who already have difficulties in accessing commercial banks and investment, there is only the option of obtaining guarantees by the government (justifying the situation of Force Majeure) than certainty to the financial institutions for repayment. Another key that will play a very important role in the coming years is the multilateral development bank, which would enable access to financing for infrastructure projects where commercial banking can no longer be reached.

As last identified initiative it is proposed to identify and develop maximum potential of possible financial compensation to rebalance concessions either monetary or in the form of change of conditions in concession contracts, temporarily or perpetually. The renegotiation of the concession fee, as well as the negotiation of contract extensions that were stipulated on contract, it is a unique moment to activate these lines of work that, although they require a strong institutional push, they can support an operator in the medium and long term to reestablish business.

At the same time, carrying out cost-benefit studies of the entire impact of an airport, both directly and induced in the region, it is usually a powerful argument for convince governments of the criticality of the business.

In addition to that, the Middle East based Emirates group has announced a cost-reduction plan to combat the ongoing situation of COVID-19 according to Air cargo news (Harry, 2020). The Emirates group cost optimization plans include delaying discretionary expenditure, stop on non-critical recruitment, coordination with suppliers to find cost savings and efficiency and reducing contracts that are not essential to maintain operations.

8.2. Optimize commercial contracts in terminal – food and beverage and airport retail

The commercial tenants of the air terminals are in a situation as critical as airports, since face the same drop in demand with some expenses considerable fixed, in addition to investments in premises commercial and stock that, in general, has a few years to be amortized. Also, most concessions commercials work under a variable payment scheme at airport based on sales, with a MAG (Minimum Annual Guarantee) that insures the airport charge a minimum regardless of sales, what in these circumstances is activated in most of the contracts.

At this time, big contracts should be meticulously reviewed for potential improvements during the period of recovery than making sure the relationship to long term with the big retailers. It can be used to renegotiate conditions such as duration or the fee in exchange for preferential treatment during these months without demand.

Weak passenger demand in the first months of recovery is expected to negatively impact commercial income, not only in the volume of passengers, as well as penetration and in the average ticket. The widespread mistrust that will exist towards the virus as well as a passenger experience degraded by controls and supervision, it is believe that the propensity to spend it will be greatly diminished, even having dwell times higher than the pre-COVID 19 period.

That is why the commercial department must carry out a deep exercise in creativity and market research to identify business items that could have more commercial outlet or that directly have volumes of high sales. As an illustrative example, develop certain sites within the terminal in pop-up format to personal protection products could be something that temporarily succeed among the majority of the passengers.

In addition, it can be seen as a value service that offers the airport. The low demand for passengers in the terminal also could be seen as an opportunity to develop and implement demanding technological tools implement in high season, to improve income or, in any case, reduce the leakage of income outside the retailers billing system. For it, implement systems such as centralized billing used by large international operators such as AENA or Changi airport, where the airport controls the box of each of the commercial premises, could for sure help the future to optimize commercial income, improving transparency and accountability.

8.3. Automate – digitalize process

8.3.1. Aena's technologies and innovation

Aena is known as one of the leading airport management companies,

it is a Spanish state-owned company that manages 46 airports and two heliports in Spain and has direct and indirect shares in another 23 airports abroad. For Aena, smart technologies and innovation are always essential for their present and future development. It is well known that Aena airports are always the most advance airports by adopting new technologies. The technologies that Aena airports are implement are always in a highest quality that guarantees a safe and comfortable experience.

With the current crisis, it is the right time for aviation industries to undergo transformation and seek new technology solutions that could help the industries now and in the future to quickly identify the likelihood of such crisis and react correctly to maintain the safe and healthy operations.

As stated by Pablo Lopez Loeches in his article published on International Airport Review (Loeches, 2020), Aena's innovations, Passenger Experience and Sustainability strategy is based on the following programmes:

- **Airport 4.0**: The software addresses the modernization and digitalization of customer experience and sustainability processes. It includes digital identity (biometrics), business, sustainability, customer support, security, environmental integration and smart service management initiatives.
- **Smart operations and maintenance management**: The system relates to the optimization of operations and maintenance processes to increase performance through the use of new technologies. The new technologies to be tested at Aena airports include video analytics, the internet of things and autonomous vehicles and handling.
- **Digital transformation of internal processes**: It is always need to improve the efficiency and agility using technology.
- **BIM (Building Information Modeling):** The program concerns the implementation of new modeling technologies to make management and maintenance more effective.
- **Cargo digitization:** The digitization of air cargo processes can streamline procedures and improve efficiency and quality.
- **Remote control towers**: Aena is working to improve the security, operation and efficiency of air traffic services through new technological functionalities.

8.4. Review service levels with providers of services

The vast majority of outsourced service contracts by airport operators have clauses, setting Level of Service (LoS) to control the quality of the services provided by the third party (Kazda and Caves, 2015). These services can be from security to maintenance, cleaning etc. corresponding to relatively large airport expense items.

These levels of service are very likely mostly out of date or not directly apply, and it is of mutual convenience to renegotiate contracts to be more efficient, not hide exist costs or hidden defects.

At this time when passenger demand is significantly low, maintaining agreed service level is not feasible and practical to work on cost reduction aspect. Services that are not required to be maintained to be reduced or merged according to the current capacity and non operations areas to be closed or scaled down in agreement with service providers to optimize operation cost. For instance, Changi Airport Group (CAG) has announced the consolidation of terminal operations by suspending Terminal 2 operations to save on running costs such as utilities and cleaning services as well as to optimize resources across the airport's terminals to better match the low travel demand and airlines as per Dermot Davitt report (Dermot, 2020).

8.5. Renegotiate payments to the government regarding concession fees and space rent

The occasion of force majeure that is being experienced requires critical measures to lighten the load financial support of airports to the possible extent, and governments are the main actors that can favor these conditions.

Industry is facing a unique situation, which no one has predicted that could impact the ecosystem of aviation so badly. Airports are now struggling to maintain operational costs as airport operations cannot be sealed and packed unlike airlines have grounded their aircraft. In most countries the majority of airports are still state-owned (central, regional or local government) for them state government is funding and giving relaxation on payment term but on the other side, the private airport operator those runs the show are seeing severe cash flow problems and seeking state government to support them. According to The Economic Times news (The Economic Times, 2020), the Federation of Indian Chambers of Commerce and Industry (FICCI) has advised the government to waive off interests and delayed charges and accruals to airport operators along with loan guarantees to the airlines to make up for the gap. In addition to above recommendation for airports, FICCI urges instant deferral of unpaid dues and accumulations of all aviation related taxes levied by states at national, regional and local level that do not contribute to the aviation ecosystem until December 31, 2020, with respect to payroll taxes, fuel related taxes and airport concession fees.

8.6. Airport concessionaire joint ventures

In this model of joint venture airports works as a landlord and partner in the operations with close coordination with vendors. Airport implies their rules and performance requirements in the joint ventures along with minimal investment. The airport operators are experienced in running businesses in an airport setting while allowing the concessionaire to focus on maintaining restaurant or any stores in a highly productive environment. The joint venture model permits the airport to supply capital with a minor cost than its business partners.

8.7. Outsource some of the non-core activities

Although the global and regional trend tends to increasingly decentralize the non-core tasks of airports to third party companies, such as security or maintenance, there are still many airports in the region that are governed by having in-house the most operations.

Outsourcing these or some other services may entail, not only an economic saving for the operator airport, but also make the cost more flexible with correct Level of Service (LoS) to be determined as a cost variable instead of fixed, something that would be valued at current circumstances.

To reduce the impact of this pandemic, airport needs to look and rethink on giving non-essential activities to key companies that could manage on variable cost basis not as fixed one. Airports have many activities that are managed by contractors and vendors but with the current situation there will be more activates that could be outsourced considering their active presence in business.

9. How to resume the airport operations

To limit the spread of COVID-19, airports are also collaborating with regulatory authorities to make passengers journey across the airport seamless as well as revising their capacity per process. In general, airport across the world are restricting access to the airport facilities only to traveling passengers and all passengers are thermally screened (see Fig. 7) and ask to wear a face mask before entering the airport facility. Fit to fly travellers will be granted access to proceed for check-in. At this point, few countries are implementing immune passport confirming the presence of antibodies for COVID-19.

With respect to changes on existing procedures implemented, the aim is to ensure that the spread of COVID-19 is minimized. Because of this, travellers may be asked to present a COVID-19 test showing that they are fit for travel. Additionally, airports are working tirelessly to implement contactless technologies across all passenger touchpoints

Fig. 7. Hamad International Airport – thermal screening processImage reference
(HIA Linkedin, 2020):.

aiming to ensure that minimum passenger contact is required with aviation staff and airport surface. These measures are translated into the new installation of self-check-in kiosks, biometrics identification speed gates, and others. Technology is as of now the main driver to ensure the objectives can be achieved and a touchless travel can be offered to passengers.

Travelers will observe increased cleaning measures throughout the terminal concourses. As per the local news agency the Peninsula (HIA Linkedin, 2020), at Hamad International Airport (HIA) all passenger touch points are being sanitized every 10–15 min by following stringent cleaning procedures, all boarding gates counters are cleaned after each flight (see Fig. 8) and using smart screening helmet for contactless temperature measurements.

10. Manpower preparedness post-COVID19 19 operations

Due to the high number of staff reporting sick during the initial months of the pandemic, changes on roster and shift patterns made airlines and airports to daily made changes to ensure critical activities can continue in case of lack of staff. For this, there are two main options: 1) Have an alternative supplier who can take over the duties of the critical functions or 2) Reduced the number of required staff to skeleton mode.

There are few guidance given in Operational and Business Continuity Planning for Prolonged Airport Disruptions in Airport Corporative Research Programme (ACRP Report-93) that the airport can establish one or more alternative resources to help it manage until it recovers the lost assets and services.

In parallel, the reduced number of operations have allowed airports and airlines to operate on skeleton mode (International Airport Review, 2020). In the case of one the staff from the skeleton has been found positive the other staff from the skeleton who has been in contact with the affected staff should be replaced by a standby team member. With the foreseen number of infected staff, it is important that during this period, leave is not granted to critical staff. The situation is so dynamic that it is not possible to predict who and when a person will be needed to cover the position of a staff who has been tested positive or identified as a close contact of an identified positive case. In general, and to ensure that virus widespread is reduced it is suggested to create teams of personnel who work during the pandemic period with the same days, timings and locations. With this, in the case that one staff is tested positive, close contact staff are easy to be identified. Managing shift patterns while balancing workload and safety and security of your employee is paramount and employer should consider Health and Safety Executive best practice (HSG 256) and fatigue and risk (HSEGOV, 2006).

Dr. Karsten Benz, Professor for Aviation Management at Frankfurt University explained: Run your airport in a survival or skeleton mode and be ready for travel to come back (Benz, 2020a,b).

Another paramount issue is with respect to training, with the reduced number of operations and the current situation of staff working from there will be a high number of personnel who has not undertaken their daily tasks for months. Hence, the importance of continually offered aviation personnel with training to ensure once the return to operations is required, the personnel will be ready and up-to-date with new procedures implemented to ensure a smooth return to operations.

Fig. 8. Hamad International Airport – Fully autonomous mobile UV disinfection robot.
Image reference
(HIA Linkedin, 2020):.

10.1. Immediate actions for airports post COVID-19

The term recovery either short or long one will not be easy for airport sector. Considering low passenger demand and uncertain future, operational considerations will be the main priority of the airport operations. Airports that emphasizes on the importance of addressing changed passenger behavior and employee needs post COVID-19, will have more agility to change and able to adjust early in the recovery.

In the short term, airports can start analysing the impacts on the industry during the journey and start collaborating with airport stakeholders in reinstating of service planning. Such efforts can be further aligned and phased with airport and customer needs.

In the medium and long term, airports will likely to consider planned investments and begin revision of strategic priorities for the implementation. Furthermore, following points suggested by Deloitte in their report (Deloitte, 2020) that describes the return of critical passenger capabilities and delivers the confidence of passengers and employee's:

10.2. Immediate opportunities

- Analyze the passenger journey to understand specific areas of concern for the customers.
- Collaborate with stakeholders to plan service-delivery ramp up – particularly for passenger amenities such as food and beverage.
- Implement low-tech or no-tech changes in the passenger journey and employee experience that give both confidence that they are safe in the airport.

10.3. Mid-term prospects

- Identify retrofit opportunities to make existing self-service technologies contactless.
- Revisit planned investments to confirm they align with postCOVID-19 passenger needs.
- Collaborate with government to implement health screening capabilities that meet local and national regulatory requirements.

10.4. Long-term goals

- Develop robust pandemic playbooks to incorporate lessons learned from COVID-19 and be ready for the next pandemic scenario.
- Accelerate implementation of biometric capabilities that significantly reduce human to human interaction points from curb to gate.
- Develop and expand operational modeling & simulation to enable real time, dynamic responses to operational changes.

11. Conclusions

With the uncertainty brought by COVID19 on the aviation industry, the organizations need to reassess the different scenarios that can occur and ensure that sustainable and safe airport operations can be maintained. Airports will face unpleasant issues caused by the pandemic such as fewer passengers, costly health regulations and airlines and tenants that do not pay their bills on time.

For financial sustainability airports should delay non-essential expenditure, stop non-critical recruitment, coordinate with suppliers to find cost saving solutions, reduce or stop not essential contracts, close or scale down non-operational areas and outsource not core services.

Possible next scenarios could be implementation of biometric and self-service process, contact-less capabilities to reduce human to human interactions and improved coordination with aviation and non-aviation (tourism) stakeholders in particular information and visions sharing of the industry.

Supporting the long-term business is the key in ensuring the survival of the organization. It is advised to transform the organization to cope with quick responses to the demand that arises in the short term. Coordination and cooperation are promoted by strong leadership, which brings great control of the situation. Uncertainty will be one of the main elements affecting airport management and airport operations. The airport operator will therefore have to consider strategies that will maximize the business in the short and long terms.

Covid 19 effects on airport design and operations will manifest in particular in the social distancing which will affect airport terminal capacity and level of services provided. Acceleration of biometric technologies deployment will also be needed, which will require improvements to the planning and implementation process.

Finally, airports that remain resilient with sustainable strategies will be able to offer wider variety of goods and services to air travelers. Successful airports will also learn from the current crisis by diversifying and turning to non-passenger revenue to compensate for the decline in air traffic.

Author agreement statement

Author Agreement Statement We the undersigned declare that this manuscript is original, has not been published before and is not currently being considered for publication elsewhere. We confirm that the manuscript has been read and approved by all named authors and that there are no other persons who satisfied the criteria for authorship but are not listed. We further confirm that the order of authors listed in the manuscript has been approved by all of us. We understand that the Corresponding Author is the sole contact for the Editorial process. He/she is responsible for communicating with the other authors about progress, submissions of revisions and final approval of proofs.

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